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ABSTRACT

This "good practice" guide is aimed at anyone in higher education in England who is involved in making decisions on investments. It focuses on the principles to be followed, rather than the techniques of appraisal. The guide outlines the steps for developing an outline business case and then refining it into a full business case for the preferred option. The guidance is supported by case studies, and examples are provided on the related Web site. Five attachments (annexes) contain an appraisal checklist, case studies illustrating the principles of investment decision making, a discussion of technical issues, and two example appraisals. (Author/SLD)

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April 2003/17
Good practice
Guidance
This report is for information

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Investment decision making

A guide to good practice

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Investment decision making

A guide to good practice

To	Heads of HEFCE-funded higher education institutions Heads of universities in Northern Ireland
Of interest to those responsible for	Investment decisions
Reference	2003/17
Publication date	April 2003
Enquiries to	Tim Russell tel 0117 931 7468 e-mail t.russell@hefce.ac.uk

Executive summary

Purpose

1. This document provides good practice guidance for anyone in higher education who is involved in making decisions on investments.

Key points

2. Sound decision-making processes are a fundamental aspect of good governance and management in any organisation. This requires a clear identification of the problem to be solved and objective appraisal of the options, if objectives are to be met and value for money secured.

3. This guide focuses on the principles to be followed, rather than the techniques of appraisal. It is aimed at everyone involved in the process, not just senior managers and members of governing bodies. It outlines the steps for developing an outline business case and then refining it into a full business case for the preferred option.

4. The guidance is supported by a self-assessment checklist (Annex A), case studies in higher education institutions (Annex B), and technical information and further examples on the web.

Action required

5. This report is for information and guidance.

Introduction

6. Sound decision-making processes are a fundamental aspect of good governance and management in any organisation. This requires a clear identification of the problem to be solved and objective appraisal of the options, if objectives are to be met and value for money secured.

7. Decisions should be justifiable: the reasons for them should be analysed and supported by evidence. To obtain maximum value from the appraisal process it is necessary to understand the assumptions on which the decisions are based, and also the circumstances that might lead to a different outcome. Consequently the assessment of risk and uncertainty will be as important as the base estimates for each option.

Using this guide

8. This guide is written for anyone who is involved in an investment decision-making process. It is not just for senior officers of institutions and members of governing bodies. Nor is it just a financial technique, but is applicable to any form of investment decision. It is also appropriate for institutions with a devolved structure, where deans, heads of departments and other senior academics are involved in decision making.

9. We have not attempted to write a textbook on investment appraisal. Techniques of appraisal are amply covered elsewhere. Instead, the main body of this guide concentrates on the principles to be followed, which are relevant to everyone involved in the process. We have illustrated these principles with a series of case studies at Annex B. We have supplemented these with more technical advice and examples in Annexes C, D and E, available with this document on our web-site at www.hefce.ac.uk under 'Publications'.

Principles

Basic steps of appraisal

10. In reaching a decision it is necessary to answer three questions:

    a. What is the problem that we are seeking to solve?

    b. What solution represents the best value, taking into account costs, benefits, risks and opportunities?

    c. Is that option affordable?

11. The appraisal process can be broken down into the following steps:

    a. Define the problem.

b. Define the objectives.

c. Consider the options.

d. Identify, quantify and assign values to the costs, benefits, risks and uncertainties associated with each option.

e. Analyse the information.

f. Consider any other factors that cannot be assigned a value.

g. Present the results.

12. This is only an outline. An institution will need to decide what it can afford within a limited budget, where the project may be a significant factor in terms of overall spending, as well as deciding between competing priorities. Therefore appraisal needs to be seen in the context of developing a business case. This is an iterative process. It should be carried out at an early stage when broad strategic options are being considered, and refined when a detailed solution is being chosen. Institutions may have to re-appraise their options as new information comes to light, or if major developments affect the assumptions underlying the appraisal.

13. In developing this guide, we have assumed that institutions will go through at least two stages: first to produce an outline business case, and then again to refine it into a full one. This guide therefore describes the steps in developing the outline and full business cases. However, institutions need not follow the process dogmatically. A simple decision could well be taken with both stages combined into a single process. By contrast, a significant project might require further iterations before the institution felt it had completed a sufficiently detailed appraisal to proceed with confidence.

How detailed should the appraisal be?

14. All appraisals should follow the same principles, but institutions will have to make their own decisions about how much detail is appropriate. The resources that go into the appraisal should be judged against the significance of the investment decision.

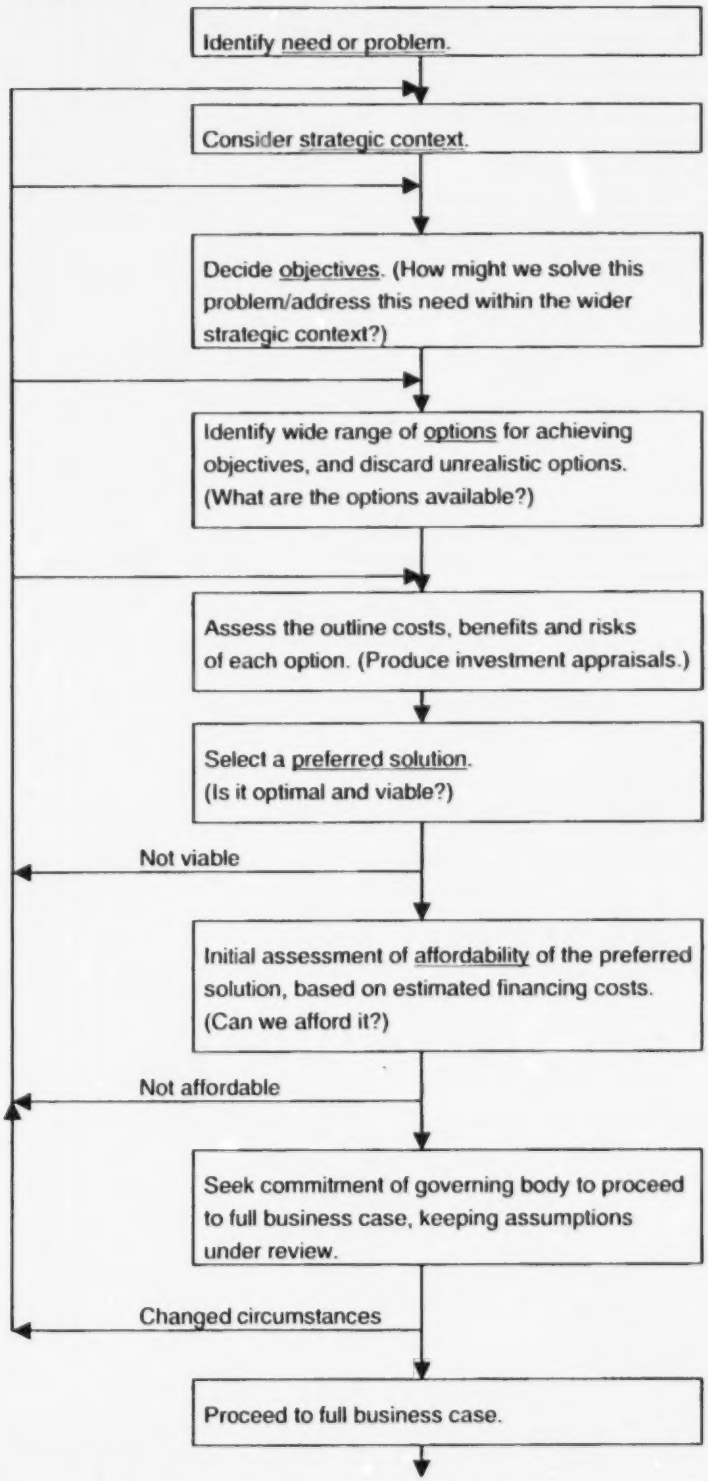
Who makes the decisions?

15. We have written this guide on the assumption that decisions will be taken by the governing body, but it is for each institution to decide the level at which decisions should be taken.

Establishing the outline business case

16. The development of an outline business case is illustrated in Figure 1.

Figure 1 Development of the outline business case


Identify need or problem.
Consider strategic context.
Decide objectives. (How might we solve this problem/address this need within the wider strategic context?)
Identify wide range of options for achieving objectives, and discard unrealistic options. (What are the options available?)
Assess the outline costs, benefits and risks of each option. (Produce investment appraisals.)
Select a preferred solution. (Is it optimal and viable?)
Not viable
Initial assessment of affordability of the preferred solution, based on estimated financing costs. (Can we afford it?)
Not affordable
Seek commitment of governing body to proceed to full business case, keeping assumptions under review.
Changed circumstances
Proceed to full business case.

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Identify the need or problem

17. At the outset, the institution will have determined that there is a problem to be solved or a need to be satisfied. This must be clearly defined, since it will form the basis of the whole analysis. As the analysis develops, it may call into question whether the problem or need does in fact exist. As a first step institutions should be sure that their requirements cannot be met from re-allocating existing resources. This will be obvious if the problem is clearly stated in the first place. This stage needs to be approached from the standpoint of testing the basic assumptions. Start from a statement of the problem that is to be solved, not a preconceived idea of what the solution might be.

Consider the strategic context

18. The appraisal must be placed in its strategic context. This should refer to the aims and objectives of the institution, the strategic plan, the capital and infrastructure plans, and other relevant policies.

Decide objectives

19. The statement of objectives sets out what is to be achieved and defines a firm boundary to the appraisal. It provides the criteria against which options will be judged, and against which the success of the project will be evaluated. Experience has shown that it is a crucial factor in the subsequent steps of the appraisal. Objectives should not be so narrowly defined as to prevent consideration of a range of options, nor so loosely defined as to generate unnecessary work. And of course they should be consistent with the strategic aims and objectives of the institution.

20. The objectives should include the scope (a statement of the range of activities which the project will be expected to provide), and the context (the facilities or services needed to carry out these activities). Institutions may find it useful to express their objectives in terms of time, cost and quality requirements, against which they can measure possible solutions. They will also find it useful to prioritise project objectives to help them judge the balance between conflicting requirements.

21. Technical constraints should not be unduly binding. In all cases institutions should guard against over-specification of requirements. Matters such as the standard of the services or facilities provided, their location, whether it is new-build or refurbishment, and procurement methods such as lease or purchase, should all be treated as options rather than objectives.

Identify the options

22. It is important, particularly for major investment decisions, to consider a wide range of options, even though many may be rejected at an early stage. Rarely will there be no realistic choice of options. Institutions must keep an open mind, and be prepared to 'think the

unthinkable'. Experience indicates that institutions gain considerable value from using a wide-ranging multi-disciplinary team, and involving the end-users in the development of the project from an early stage. They may also need external professional advice to help them identify options: for instance, estates surveyors to identify locations for new facilities, or specialists to advise what information technology solutions might be feasible.

23. Institutions must include a 'do nothing' option as a baseline, even if it falls short of the operational requirement. It will be the basis for comparing the costs and benefits of all the other options, and for determining the priority attached to the proposal.

24. Where a 'do nothing' option is clearly unacceptable, then a 'do minimum' option should be considered. This situation is rare, but might occur, for instance, if there was a statutory obligation to be met.

25. Before proceeding to a first assessment of costs, benefits and risks, some options can be discarded if they are clearly unrealistic. There must be good grounds for rejecting them: the process must not be used to rule out options just because they do not fit with preconceived ideas.

Assess outline costs, and benefits, risks and uncertainties

26. Appraisal is concerned with obtaining the best use of resources. Where the costs and benefits of a project will accrue exclusively to the institution, then that is all that needs to be included in the appraisal. However, there may be occasions where a project is financed jointly by the institution and another body. For example, an institution might receive support from a lottery board, for a project intended to bring benefits to the public at large, as well as meeting the institution's own needs. Alternatively, it might consider a joint venture with a commercial organisation. In cases such as these the costs and benefits to the wider community, or to other interested parties, will need to be included in the appraisal. Other external costs and benefits should be included only where they are relevant to the objectives of the proposal or could influence the ultimate decision.

27. It is particularly important that decision makers take account of risk and uncertainty. In many cases, their impact can be valued and factored into the decision-making process. Even when the impact cannot be defined precisely, institutions must recognise the potential for risk and uncertainty to influence their decision. The process will be clarified if the risks and uncertainties are set out in a formal risk register. This can be refined as the appraisal process proceeds, and the institution gains a better understanding of the potential impact of the risks and uncertainties, and how that impact might be mitigated. We provide more detailed advice in Annex C on how risk and uncertainty can be handled.

28. An appraisal should contain a list of the factors to be considered in each option, even when it is not possible to quantify them, or value them in monetary terms. Appraisals are often primarily concerned to identify the best value option for a particular standard provision, such as teaching accommodation, but even then the benefits may vary. For instance, the quality of accommodation may affect performance – measured by attendance, actual output

or staff turnover. Other relevant benefits may include a convenient location, and reducing work on split sites. Equally, there may be disadvantages or penalties attached to some options. The appraisal should assess, and where possible quantify and value, all such benefits and penalties.

29. The values included in the appraisals should be realistic and objectively assessed. Being over-optimistic about values or dates could lead to the wrong conclusion. Risk-adjusted comparison is essential to ensure that options are considered on a like for like basis. A sensitivity analysis of the key assumptions should be undertaken to identify those that are critical to success.

Select a preferred solution

30. At this stage, many of the costs and benefits will be difficult to define and quantify precisely. More detailed advice on how to handle these aspects is given in Annex C. The main object is to select a short-list of solutions that can be tested for affordability, so that the institution can decide whether it has a preferred option to take forward for more detailed analysis. Of course, this more detailed analysis will have to consider competing options as well, since the relative costs and benefits may change when examined more closely. However, those that are clearly non-competitive can be discarded at this stage.

31. The preferred solution must be viable. For instance, there would be no point in continuing to analyse what purported to be the preferred solution if there is no demand for the particular course or service.

Initial assessment of affordability

32. At this stage, it is unlikely that the institution will have explored all the procurement options available, or how they might be financed. For a first assessment of affordability, the institution will need to estimate the financing costs to see how they might fit its overall financial strategy. This may indicate that the preferred solution is not affordable, even though it is viable. In these circumstances, the institution may have to consider the next best option, look again at how the option might be financed, or consider a change to the scale of the project.

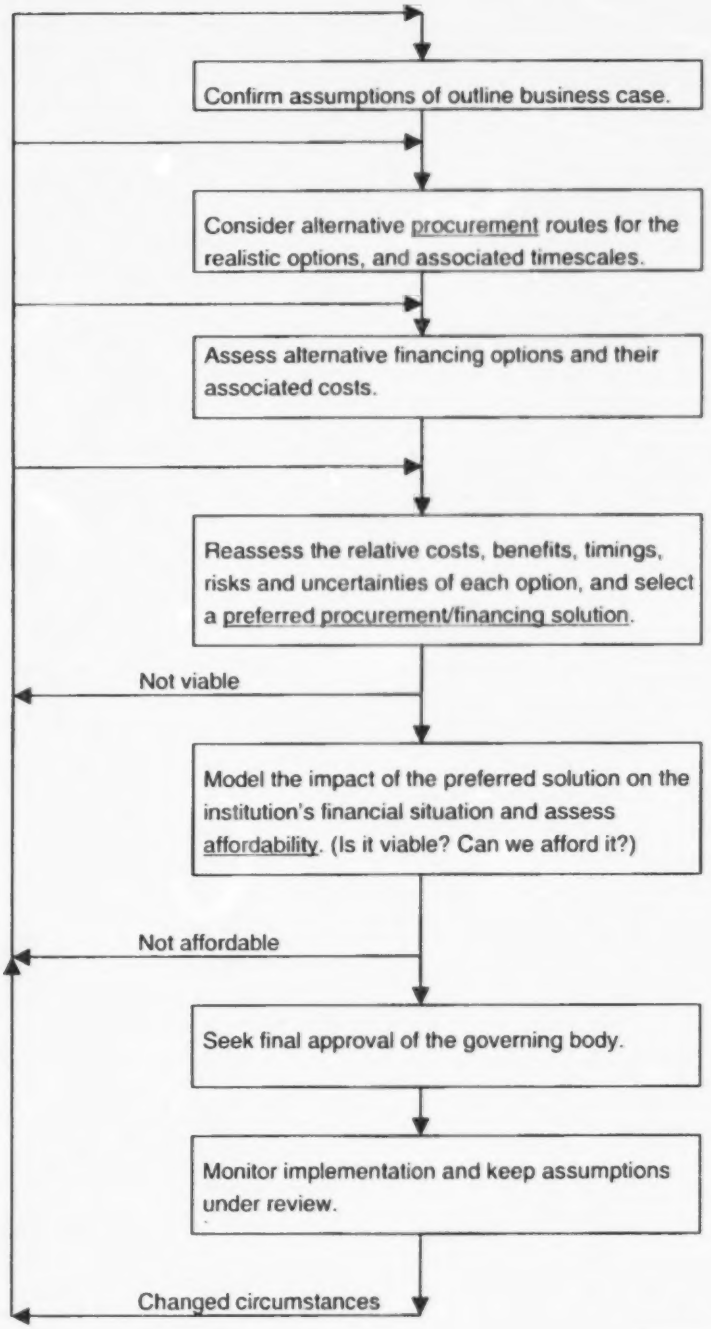
Seek commitment of the governing body

33. Before proceeding to a full business case, institutions should seek the approval of their governing body or the appropriate delegated authority. The decision makers must have an exposition of the business case at an appropriate level of detail to match the scale of the project. It is not sufficient for them to be presented with a 'take it or leave it' decision: they must understand the range of choices open to the institution, and the logic behind the selection of the preferred option. Further advice on the responsibilities of governors is available in the 'Guide for members of governing bodies of universities and colleges in England, Wales and Northern Ireland'. This is published by the Committee of University Chairmen and available from HEFCE (HEFCE 01/20).

Developing the full business case

34. The steps involved in developing a full business case are shown in Figure 2. Institutions should plan to complete all the steps in the appraisal before they commit themselves to a preferred option and agree the final deal, so as to optimise their negotiating position.

Figure 2 Developing the full business case


Confirm assumptions of outline business case.
Consider alternative procurement routes for the realistic options, and associated timescales.
Assess alternative financing options and their associated costs.
Reassess the relative costs, benefits, timings, risks and uncertainties of each option, and select a preferred procurement/financing solution.
Not viable
Model the impact of the preferred solution on the institution's financial situation and assess affordability. (Is it viable? Can we afford it?)
Not affordable
Seek final approval of the governing body.
Monitor implementation and keep assumptions under review.
Changed circumstances

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Confirm assumptions

35. With the commitment of its governing body, the institution can devote more resources to exploring the appraisal options in detail. As a first step it will need to confirm that the original assumptions are still valid. It can then focus on a more detailed appraisal of the realistic options.

Consider procurement routes

36. In particular the institution will want to explore the practicality of different procurement routes. There may be a number of further stages to consider, since each option may have a number of different procurement routes with different costs, benefits and risks. For instance, an option which involved a new building might be procured through a Private Finance Initiative (PFI) solution based on service delivery, or by a conventional design and build contract. Whereas an option to refurbish an existing building might have a different range of procurement options.

Assess financing options

37. At this point the institution will need to explore in more detail the financing options and their associated costs. In some cases, such as PFI, the financing method is closely linked to the procurement route. For more traditional procurement, a number of financing options will still be available, from the use of reserves to a wide choice of short-term and long-term borrowing arrangements. The institution will need to consider the requirements of its Financial Memorandum with HEFCE at an early stage if it is likely to need approval for an increased annualised servicing charge.

Re-assess and select preferred solution

38. In analysing the various combinations of options, procurement routes and financing options, institutions will need to consider in detail the risks and uncertainties associated with each. More detailed advice on how these should be treated is given in Annex C. At this level of analysis, it is likely that the prospective solutions will have different levels of risk, and so comparisons will have to be made on a risk-adjusted basis. This is particularly true if PFI solutions are being considered, when transfer of risk is one of the benefits being sought.

Financial impact and affordability

39. The institution will need to re-assess the impact of its preferred solution on its overall financial situation, in the light of the increased level of detail available in the full business case. This will be the basis for the analysis of affordability that it will present to the governing body for final approval. If at this stage the chosen solution appears unaffordable, this may signal that the initial assumptions need to be revisited.

Presenting the results

40. The results of the appraisal should be set out in a comprehensive report. A detailed checklist is provided in Annex A, and further advice in Annex C.

Approval

41. Governors will need to understand the logic behind the choice of the preferred solution, but also the risks and sensitivities that go with it. Even when approval has been given, the management of the institution should advise the governing body if subsequently any of the assumptions are invalidated, as this may alter the decision reached.

Monitoring and evaluation

42. At the time of the appraisal it is important to plan for monitoring during implementation and post-project evaluation of the decision. This provides feedback into future decisions. Evaluation should cover the extent to which the objectives were met, any cost and time overruns, the relationship between estimated and actual costs and benefits, and any implications for future decisions.

43. The appraisal report should specify the monitoring data which will be collected in the course of implementation. This will serve as a management tool while the project is under way, and provide the main information for the evaluation. The appraisal report should also outline how a full evaluation might be carried out. The decision whether to proceed with a full or partial evaluation can be taken at a later stage.

44. The evaluation should usually be carried out when the investment stage is complete and when enough experience has been accumulated of operation and maintenance.

Annex A

Appraisal checklist

Specifying the objectives

- How does this appraisal relate to the strategic aims of the institution?
- Is the problem clearly defined?
- Are the objectives supported by adequate background information, such as a strategic plan?

Identifying the options

- Has a sufficiently wide range of options been considered?
- Has the 'do nothing' or 'do minimum' option been explicitly considered?
- Have all realistic procurement options been appraised (including PFI and other innovative forms of procurement)?

Valuing costs, benefits, timing, risks and uncertainties

- Has account been taken of all the direct costs and benefits accruing to the institution?
- Are there any wider considerations?
- Have all relevant costs, income streams and benefits (over the life of the project) been included?
- Has allowance been made for running costs over the life of the project?
- Have maintenance costs over the life of the project been taken into account?
- Does the appraisal take account of assets that are already owned (opportunity costs)?
- Does the valuation of the property represent the opportunity cost?
- Is there any double-counting of costs and benefits?
- What allowance has been made for non-financial aspects?
- Have uncertainties in key assumptions been identified and tested?
- Have risks been assessed and valued?

Analysing the results

- Has the net present value been calculated for each option?
- Are the price base and the base date for discounting explicitly defined?
- Has an appropriate discount rate been used?
- Are all costs expressed in real terms?
- Is there a relative price effect to take into account, where prices change at a different rate to general inflation?

Assessing affordability

- Has the impact on the institution's overall financial position been assessed?
- Can the institution accept the best and worst case scenarios?

- Does the preferred solution require HEFCE approval?

Presentation of results

- How does the chosen option compare with the alternatives?
- Are the results set out clearly, in an appraisal report, in a logical order and with all relevant assumptions made clear?
- Are tables available showing the details of costs and benefits for all options?
- Do they show the effects of risks?
- Do they show the influence of sensitivities?
- Is the overall financial impact clear?

Monitoring and evaluation

- Is provision made for monitoring project performance?
- Are proposals included in the appraisal report for evaluating the project and its performance once implemented?
- Is the timescale for evaluation defined?

Annex B

Case studies

Case study 1 University of Sheffield and overseas collaborative provision

1. In common with several other higher education institutions, the University of Sheffield is committed to the delivery of courses off-campus, through a programme of franchising and validation agreements. Its Board of Collegiate Studies is responsible for the validation and licensing of such schemes.

2. Some of the university's collaborative schemes were established with partner institutions overseas. Such arrangements are seen as bringing benefits to both parties.

3. The Board of Collegiate Studies has established procedures to run in parallel with the academic evaluation of prospective partner institutions, in accordance with the following principles:

a. Existing financial directives state that heads of department are responsible for 'the effective, efficient and economic use of the resources allocated to the department'. Therefore, for each proposed project the head of the academic department concerned shall nominate a project leader who will provide the academic advice and expertise required to consider and, where necessary, progress the project.

b. To ensure compliance with existing financial directives, the project leader is to make an assessment of the resources required to consider, implement and operate any proposed project, before any contractual commitment is made. This submission is to be passed to the finance department for formal costing. Each submission is to be countersigned by the relevant head of department to confirm that the proposal has their approval and that the resources are sufficient (this implies that a source of funding has been identified).

c. The finance department will use the information supplied by the initiating department to provide a full costing, with copies being supplied to the project leader and the Office of Collegiate Studies.

d. Where appropriate the finance department will prepare a financial model, suitable for inclusion in a business case, to facilitate a sensitivity analysis of key factors and an assessment of the financial viability of the project.

e. A representative of the finance department will be involved in all financial and contractual discussions with any potential partner or applicant institution.

f. A representative of the finance department will be present on any initial inspection visit, with the brief to investigate the financial status of the applicant and explore potential financial arrangements.

g. Following the investigation and discussions in paragraphs 3e and 3f above, the finance department representative will prepare a financial report to assist in the decision-making process. This report will cover:

- the forecast income and expenditure, identifying any assumptions used in preparing the forecast
- an assessment of the financial status of the applicant
- any recommendations as to contractual terms to be included in any proposed agreement
- any specific areas of risk which should be notified to the Board
- comments regarding an exit strategy from any agreement.

h. Other elements to be checked include:

- ensuring that there is the ability to provide the infrastructure to deliver the course and adequate financial management support
- the legal status as well as the financial statements of the prospective partner and its capacity to enter into a contract
- references from other UK partners and from government officers, including ones in the country in which the potential partner is based.

i. Periodically the Board will ask for reports on the financial progress of each project, detailing – as a minimum – the income received and expenditure incurred together with any relevant information consistent with good management.

4. Following these principles, the Board should have comprehensive information, not only on the academic issues but also the financial matters relating to any potential partner, sufficient to enable an informed decision to be made. Such information would also help in the preparation of any formal agreement consistent with effective management of risk.

Key point of good practice

5. By establishing a formal procedure to collate the necessary information, the university has facilitated a proper appraisal of the viability, affordability and risks of potential collaborative projects.

This case study was prepared with the assistance of David Bearpark, Director of Finance at the University of Sheffield.

Case study 2 Merger between Chester College of Higher Education and Warrington Collegiate Institute

1. Warrington Collegiate Institute is a further education college. However, 28 per cent of its activity was higher education, centred on a separate site, the Padgate campus. During 1997 it identified potential difficulties in future student recruitment, and a need to establish a new position and a distinct identity remote from further education.

2. As a first step the institute initiated discussions with the University of Manchester, which it saw as the natural focus of a partnership since the university validated its higher education activities. However, after considerable discussion at all levels it became clear that the respective visions of the two institutions relating to the future role of the Padgate Campus in the work of the university could not be reconciled. The distinct identity of the Padgate campus would be lost, and early in 2001 it was agreed that a merger with the university would not be appropriate.

3. The institute therefore researched other potential partners among higher education institutions in the area. It identified a number of key factors which would inform a decision:

- a shared vision
- shared priorities
- consistency between strategic plans
- size and structure
- a willingness to integrate the institute as an equal partner
- the need to protect the interests of higher education in Warrington and its immediate environs.

4. An initial appraisal of potential partners was based on these qualitative factors. As a result, the institute identified Chester College of Higher Education as a potential partner. Both parties accepted that a proper assessment of this option would involve significant resources, both financial in undertaking due diligence studies, and in senior management time in progressing the merger project. A wide range of interested parties would have to be consulted, and a number of decision makers would be involved. Further exploration of the possibilities could only proceed on the basis that the governing bodies were committed to the process.

5. Both parties identified a number of risks to be managed if a successful merger was to be achieved. Significant among these was the importance of local politics, and the need to generate acceptance of the proposals outside the two institutions themselves. Much effort was directed towards mitigating the potential impact of such risks.

6. It was clear that a detailed appraisal of the merger option would require a number of technical issues to be addressed. To manage this process, the institutions set out a timetable for the decision-making process, and established an activity matrix as an aid to structured decision making.

7. The decision-making structure was based on a Merger Steering Group, formed from key staff in Chester and Warrington. Its work was supported by six sub-groups, each chaired by a member of the steering group:

- strategic management and external liaison
- human resources and communications
- finance and estates
- curriculum planning
- information technology
- quality management and student support.

8. Terms of reference were established for each sub-group and a task list was derived from the activity matrix. The steering group met every three weeks to receive reports from the sub-groups and to consider the outcomes and issues that arose. Underlying the whole process was the need to construct a bid to HEFCE's Restructuring and Collaboration Fund which would justify the cost of the merger.

9. The governing bodies accepted that the commitment of resources to the appraisal process constituted a risk in its own right, which had to be managed. A number of 'staging posts' were established, at which the intention to proceed further could be confirmed. This led to a point where the governing bodies of both institutions could take an informed decision.

10. A merger was achieved in August 2002.

Key points of good practice

11. The way in which the decision process was managed shows:

- recognition that the decision had to be taken in a strategic context
- identification of the qualitative factors which would inform a decision
- commitment of all parties, from governing bodies downwards, to resource the decision-making process at an appropriate level
- a recognition of the risks that could impede a successful conclusion, and steps taken to mitigate those risks
- a structure that facilitated the involvement of stakeholders in the decision-making process
- a staged approach to a final decision
- the importance of close monitoring of progress, and maintaining staff commitment to the project throughout a lengthy process.

This case study was prepared with the assistance of Professor Tim Wheeler, Principal of Chester College of Higher Education, and Dr Malcolm Rhodes, Assistant Principal, Corporate Planning and Development.

Case study 3 University of Exeter – involvement with Combined Universities in Cornwall

1. The Combined Universities in Cornwall (CUC) is a partnership, of which the University of Exeter is a founding member, between a number of higher education institutions and further education colleges. The partnership aims to draw on the strength of its members to offer Cornwall a major increase in higher education opportunities. This will be delivered through a 'hub and rim' concept, with the rim being largely provided by the further education colleges, and the hub provided at a new campus, Tremough, housing developments by Falmouth College of Arts and the University of Exeter.

2. Developments are to be undertaken in two discrete and self-sustaining phases. In the first phase the university's contribution will be mainly the provision of teaching and research in science subjects, and will include a relocated and transformed Camborne School of Mines (CSM), and the Institute of Cornish Studies. This case study is principally concerned with the decision-making process which committed the university to the first phase.

3. The two main benefits for the university which the CUC offered were:

- the opportunity to expand in particular academic subject areas through access to resources which would not be available at its Exeter base
- the opportunity to deliver an important element of its regional mission in the South-West, by providing higher education facilities in Cornwall which would act as a catalyst and driver for economic regeneration.

4. In addition, the prospect of a new multi-subject hub at Tremough offered another option in the university's consideration of the future of Camborne School of Mines, situated in a separate location at Pool, Cornwall. Other options under consideration were:

a. Do nothing.
b. Stay at Pool, with the same courses but with some refurbishment.
c. Stay at Pool, but with an enlarged footprint similar to that proposed for CUC.
d. Move to Exeter.
e. Closure.

5. A detailed analysis showed that all these options had a significant downside compared with CUC, and all except the 'do nothing' option carried significant financial penalties.

6. The capital funding requirements for the development were to be met from a number of sources, including:

- European Union Objective 1 funding
- contributions from the Regional Development Agency
- grants from the Department for Education and Skills via HEFCE.

7. Core recurrent funding was to come from additional teaching and research grant from HEFCE. Working capital would be from HEFCE and Objective 1, to bridge recurrent funding gaps before all the students were recruited, and until eligibility for quality-related research funding in respect of new academic staff was established.

8. The university took the position from the outset that it would only proceed with the project if adequate capital, recurrent and working capital resources could be secured. It was not prepared to take on any form of borrowing to support academic activities, nor to transfer funds from its Exeter-based operations. However it was prepared to entertain borrowing to provide student residences and other facilities with identified income streams.

9. The project had many stakeholders. The responsibility for developing the proposals and bringing them before the university Council rested with a small senior management team. But both the Senate and the senior management group (consisting of heads of schools and administrative divisions) were kept informed and given the opportunity to discuss the project.

10. However, the ongoing operation of its activities on the Tremough campus would still represent a major commitment for the university, and the key decision rested with the university Council. To aid its decision making, the Council established the Council Ad Hoc Advisory Group (CAHAG). Its terms of reference were to:

- develop an understanding of current developments under the CUC initiative, with emphasis on aspects which impinge on the governance of the University of Exeter
- provide advice to the Policy and Resources Committee and to Council on any major decisions relating to the CUC, with particular reference to governance responsibilities. Specific attention will be given to the robustness of recommendations made to these bodies from the financial, risk assessment and risk management viewpoints.

11. Membership of CAHAG was drawn from senior lay and academic members of Council who were not involved in developing and managing the project. CAHAG met the management team regularly to develop its understanding of how the team was going about its work, but did not seek to influence the direction of that work.

12. Below is a summary of the information provided to the Council to inform its decision. This gives an overview of the work which contributed to the decision-making process, and illustrates the breadth of the issues considered.

a. The combined plan – based on a comprehensive and thorough market assessment of demand for student places. It showed how the proposals for a phased development at Tremough would meet this demand, and set out the capital and recurrent costs of the project.

b. The academic plan – setting out proposals for the integration of teaching and research activities on the new site, and responsibilities for quality assurance.

c. The constitution – setting out proposals for the governance and administration of the CUC initiative.

d. A master plan – defining the physical characteristics of the Tremough development. A framework for its operation was set out in various legal documents.

e. A financial plan – showing the level of surplus which the project would generate, with a sensitivity analysis illustrating the impact of significant income risks.

f. Alternative strategies – with a detailed analysis.

g. Risk analysis. The CAHAG's specific focus on risk led to the development of a detailed risk register, identifying the key risks and actions that could be taken to mitigate them. It also identified the exit strategies available to the university. The risk analysis provides an ongoing basis on which to review the progress of the project.

h. An independent report by CAHAG to inform the Council's decision.

Key points of good practice

13. The management of the decision-making process shows:

- recognition that a decision would need to be based on a wide number of considerations, and not just a financial analysis
- a structured approach to the identification and management of risks
- the need to reconcile the strategic objectives of a number of stakeholders
- consideration of how best to inform a decision involving a number of complex and inter-related issues – which led in this case to the establishment of an advisory group.

This case study was prepared with the assistance of Ian Powell, Registrar and Secretary of the University of Exeter, Russel Seal, Professor John Inkson and Professor Stephen Lea.

Annex C

Technical issues

1. In setting out this guidance we used the latest Treasury guidance as a starting point. 'The Green Book – Appraisal and Evaluation in Central Government' (HM Treasury, 2003) sets out the principles to be followed. References to the Green Book in subsequent paragraphs are to this latest edition.

Valuing costs, benefits, risks and uncertainties

2. Considering the implications of each option will involve establishing all the costs and benefits, including non-financial benefits and penalties. It will also involve analysing the effect of variations in timing, and any risks and uncertainties.

3. For a typical project, relevant costs might include:

   a. Capital costs – such as equipment, land, demolition, construction or refurbishment costs, fees and expenses, commissioning and handover costs.

   b. Running costs – such as staff costs, consumables, maintenance, rates, water and sewerage charges, power. heating, lighting, and payments for contracted-out services.

   c. Costs of other features affected. These may be associated with ease and availability of access, operational convenience, ease of communication, flexibility, environmental factors, and costs of retaining and disposing of vacated accommodation.

4. Relevant benefits would typically include:

   a. Fee income from further student enrolment.

   b. Research income.

   c. Rental or conference income.

   d. Income from third party use of facilities.

   e. Capital receipts – such as proceeds from disposal of the building being replaced.

   f. Residual value at the end of the appraisal period.

   g. A reduction in rental payments if a leased building is no longer required, and can be surrendered.

5. All relevant costs and benefits should be included, even where the costs do not involve cash expenditure. For example, the value of an asset should be included even when it is already in the institution's ownership. Such an asset could be used for other purposes or sold if it were not employed in the project being appraised, and therefore there is a cost involved in using it, the size of which depends on the alternative uses. This is known as the opportunity cost. For property, the opportunity cost is normally taken as the market value or the value in alternative use, whichever is higher. Similarly benefits, in the form of cost savings or an improved quality of output, should be included even where they do not produce a cash flow.

6. Some assets will have a value at the end of the appraisal period – the residual, exit or disposal value – which should be counted as a benefit. These assets may not be just land or buildings: ongoing businesses and intellectual property rights (IPR) can also have a residual value. Such values should be assessed in prices current at the date of appraisal.

7. When calculating residual value, land and buildings should be considered separately. Buildings generally depreciate over their lifetime, at a rate depending on standards of maintenance, but possibly also reflecting obsolescence. On the other hand the site value may remain constant, or even appreciate. Accordingly the usual assumption is that the value of the site remains unaltered in real terms. Actual increases in land prices should not normally be counted as benefits, as they would have occurred even if the project had not taken place; they would be realised equally by the 'do nothing' option. The building's residual value will be that which gives the highest figure from the range of options, including refurbishment, alternative use and site value.

8. There are complex issues associated with property valuation. The Royal Institution of Chartered Surveyors Appraisal and Valuation Manual gives a detailed framework and guidance. This is an area where institutions should seek professional advice.

9. Many types of cost or benefit can be included under a number of heads, but their value must only be counted once. Examples of a double counting error are the inclusion of both rents and capital values for the same building in the same appraisal; or including what is a cost in one option as a benefit in another. The 'do nothing' option provides a common baseline to avoid this sort of mistake, since each option in the appraisal should represent a change from the base case.

10. Costs and benefits that can be valued in monetary terms should be allocated to the time period in which they are expected to occur. It is generally sufficiently accurate to treat all costs incurred in a particular year as falling at mid-year. However, longer-term variability in timing can significantly affect the appraisal, and the range of options should include possible scheduling variants for the same idea. Even if monetary values cannot be assigned, it is important to indicate how the timing of impacts will be spread over the appraisal period.

11. Estimates of costs and benefits should include assessments of any risks or uncertainties. It is helpful to list them all in a risk register, to ensure that none are overlooked.

This can then be used as a checklist to ensure the analysis makes proper allowance for the significant ones. Risk and uncertainty are dealt with in paragraphs 33-42 below.

Appraising non-financial aspects

12. In an environment such as higher education, many benefits of an investment decision will not be realised as a cash flow. Especially difficult to analyse will be those benefits which cannot be expressed in financial terms at all. In many cases, institutions will have to make a judgement as to the desirability of an investment's outcomes, and what is a fair price to pay for them. However, such decisions are easier if the relative merits of different decisions can be presented in a rational way.

13. Appraisals will have to handle non-financial aspects in different ways, depending on how easily they can be measured. They can be categorised as:

a. Costs and benefits which can be valued.

b. Costs and benefits which can be measured in some other way.

c. Costs and benefits which cannot be measured at all in conventional terms.

14. In practice it may be possible to put values on the benefits and costs of a decision, even though there is no market value for them that can be realised in cash terms. For instance, investments that save staff time can be compared by putting a value on the time saved; locations for a student residence might be compared by including the costs to the students of using public transport.

15. If institutions use this method of comparing alternatives, they must be careful to distinguish between the notional values, which will influence their decision on which option offers best value for money, and the actual costs which will have to be met from their budget. There is no sense in selecting an apparently attractive option if it proves to be unaffordable in cash terms. Further advice on assessing affordability is at paragraphs 57-60.

16. There may be costs and benefits which can only be assessed in non-financial terms, but which can nevertheless be quantified. For example, options may deliver more or less of an outcome, whether it is units of student accommodation, seats in a lecture theatre, or shelf space for books. Institutions can use such data to inform their decisions. It is often helpful to understand what is the incremental cost of a particular feature. In such cases, institutions will have to decide what is a reasonable price to pay for the additional benefit.

17. A different problem is posed by attributes which cannot be measured in conventional terms. For instance, alternatives may offer different levels of satisfaction under headings such as:

- the contribution to an institution's long-term strategy
- flexibility for the future

- political acceptability
- enhancement of the institution's academic image
- compliance with planning constraints
- protecting an institution's market position.

18. Institutions often have to make qualitative judgements of this kind. Their appraisal will carry greater conviction if the basis for the decision is made clear. They should therefore be explicit about the criteria used, and how they assess each option. The simplest analysis is to define the criteria that are significant in the appraisal, and rank the options in order of preference. The institution will have to reconcile the perceived benefits with the cost of each option.

19. A scoring system, even a subjective one, can help to clarify the decision process and give it more rigour. The institution must first decide what criteria are significant and how to score them; scores can be weighted to reflect relative importance. The results are only an aid to decision making, and can never relate to any absolute measure. However, even if the scores and weightings are fundamentally subjective, the institution will be in a better position to explain the rationale for its decision.

20. One such scoring system is included in the case study at Annex D.

Taxation

21. In assessing affordability, higher education institutions need to take account of tax. In particular, they have limited scope for recovering VAT. In their appraisal, institutions must include all the cash flows they will actually incur. Taxes fall under this heading, as do charges arising from the occupation of property which vary according to location, such as business rates and water and sewerage charges. In formulating cash flow statements and in determining its own preferred solution, the institution should consider the impact of VAT on both capital and recurrent items. Even when they are totally dependent on public funds, institutions must still be aware of the effect of taxation on their cash flows.

Appraisal period

22. The appraisal period should normally be the period for which the service is required, or the remaining economic life of the main asset.

23. For buildings it is essential to distinguish between the physical life of a building and the period during which it has occupational value, which may be much shorter. A new building may typically have a physical life of over 60 years provided it is properly maintained. Its occupational value will fall during that period. However, at several points during its physical life, reduction in the occupational value can be restored by refurbishment. At these points an appraisal will be required to confirm continuing need and to determine the relative merits of refurbishment, redevelopment or disposal.

24. In the absence of any other determining factor, it is sensible to use an appraisal period of 25 years for buildings, unless there are compelling reasons for choosing another figure. Since 25 years is traditionally the length of a property lease, this assumption will facilitate comparisons between freehold and leasehold.

25. In exceptional circumstances, where buildings are constructed for a specific purpose, and no market exists for the property, it may be appropriate to appraise a building over its physical life. If a property option is appraised over more than 25 years, it should be scrutinised carefully, and the cost of refurbishment or the replacement of major elements needed to retain its physical life should be included.

26. If, exceptionally, the project exceeds the remaining economic life of its building, the appraisal must still consider all the costs for the whole life of the project. These may include the costs of decanting from the building, and of refurbishment or redevelopment.

Procurement options

27. Each option being appraised may be associated with a range of procurement methods. Options may include a range of financing options, and various forms of public/private partnership. Institutions should be careful to distinguish between the cash flows associated with funding the procurement method, such as loans and interest payments, and those associated with the costs and benefits of each option. Financing options might include:

- financing capital expenditure from internal funds
- loans
- finance leases
- operational leases
- private finance initiatives (PFI)
- joint ventures
- contracting out.

28. Where any form of external finance is involved, the source should only be selected after a competitive procurement exercise. Similar considerations will apply to nearly all forms of procurement, and in many cases the institution will be subject to the European Community Procurement Rules. There are a few exceptions. For instance, if the institution receives an approach from the private sector for a joint venture, then the deal can only be negotiated with the proposer of the scheme. If in doubt, institutions should take legal advice on whether EC Procurement Rules apply.

29. If a PFI solution is to be considered, there may not be enough cost data in the early stages to make an appraisal. Under these circumstances, institutions should cost a 'reference project' based on supplying the same outputs procured conventionally, to provide the comparator for assessing the viability and affordability of the project.

30. The full range of procurement options may not apply in every case, but the appraisal should consider all realistic combinations. For example, the decision on whether property is

to be purchased or leased should be determined on value for money grounds. Projects involving leasing property should also be appraised on the basis of buying the freehold interest in the property if it is available. If not, buying an alternative property should be included among the options, even if the institution believes there are compelling reasons for preferring a leasehold option. Similar principles apply to equipment and other types of investment decision.

31. Buying equipment or a building may offer better value for money than leasing; capital finance costs may be lower than rentals, and freehold ownership has a residual value. But in some cases there may be no property available for purchase immediately. In others, differences in quality, the earlier availability of leasehold or its greater flexibility, including the option of short-term use, may offset the benefits of purchase. When comparing freehold and leasehold options institutions should allow for the effects of tenure on running costs. For instance, the leasehold option may assign some costs or risks to the owner. Options such as PFI can offer even greater opportunity for risk sharing.

32. Some appraisal exercises involve looking at solutions that are not procurement options in the conventional sense. For instance, an institution could be faced with choosing which of several teaching methods to develop, which require the investment of staff time; or having to decide between a number of research projects. In both cases, staff time represents a resource which has an opportunity cost, and the institution is effectively appraising options for procuring teaching or research.

Valuing risk and handling uncertainty

33. Estimates of costs and benefits always involve assumptions about the future. Changes in assumptions can seriously affect the balance of advantage between options, so it is important to take account of them in the appraisal. The risk register, compiled to show all the areas of risk and uncertainty, is a good starting point. In considering how they can be handled, it is helpful to distinguish between risk and uncertainty.

Risk

34. Risk is the product of probability and consequence. If these two factors can be quantified, then the overall effect can be measured, and a risk assessment made. Depending on the procurement method, risks will have different effects. For instance, a design and build contract will transfer the financial risks of construction to the contractor. If PFI procurement is used, many more risks can be shared with the private sector. In deciding what risks to allow for, it is helpful to construct a risk matrix showing the different options under consideration and, for each one, where the effect of each risk will fall.

35. A number of techniques exist to incorporate risk in an investment appraisal, but in most cases a simple risk adjustment is most appropriate. For each variable, a cost or value can be calculated by assessing the financial impact multiplied by the probability of the event occurring. For instance, if late completion of a new building will result in a consequential cost, then the effect can be expressed in financial terms. Analysis of this sort depends on having

sufficient data to estimate the probability and consequences of the event. This might be from the institution's own experience of similar projects, or perhaps from published sources.

36. Institutions are likely to find this simple risk adjustment technique the most useful. It is particularly relevant when appraising a number of options representing different levels of risk to the institution, such as options which include procurement using PFI. It makes the effects of sharing risk readily apparent, and allows comparison between options that transfer different amounts of risk.

37. If a PFI option appears to be the most favourable, institutions will need some sort of comparator to check that the successful bid still represents better value for money than a conventionally procured alternative. In public sector procurement this is called the public sector comparator (PSC), though in the higher education sector a more appropriate title is conventionally procured comparator (CPC). The CPC is a costing of the equivalent level of service delivery procured by conventional means or, if the same level cannot be achieved, the next best option. Because the PFI supplier is likely to take a different level of risk, the comparison must be made on a risk-adjusted basis. The CPC must also include the cost of financing conventional procurement.

Uncertainty

38. Where the probability element of risk cannot be quantified, uncertainty remains, and there is still scope for testing the effects of altering key assumptions by sensitivity analysis. An appraisal should indicate the accuracy of all cost and benefit estimates. Unless the figures are certain, the effects of variability should be assessed. One way is to ensure that all possible abnormal effects have been identified, and a view taken on their significance. Another is to scrutinise critically the cost and benefit estimates, using expert advice as necessary, and taking into account experiences of cost and time over-runs for similar completed projects.

39. Sensitivity analysis involves repeating the appraisal calculation with the value of the cost or benefit set at the upper or lower end of the range of likely estimates, and possibly at some intermediate values. In addition, some account should be given of the effect of different combinations of individual elements.

40. For instance, in an appraisal of a leasehold option with a five-yearly rent review, it might be appropriate to consider cases in which the rental growth in real terms varied about the central estimate. The range used must represent a realistic assessment of the range of possibilities. It may be prudent to assume that initial estimates will be subject to the same degree of error as occurred on average in the past, unless there are reasons for thinking that they are more accurate. Such reasons should be explained and justified.

41. Income expectation is also subject to uncertainty. For example, if an option depends on additional student numbers, sensitivity analysis should be used to assess what might happen if student numbers fell. Similarly, where the project assumes income from disposing

of a property, then sensitivity analysis should address the effect if it realises more or less then its valuation.

42. It is important to minimise, and where possible remove, the likelihood that costs turn out higher than expected, or benefits and cost savings lower than expected. It may be necessary to draw a distinction between different project options, and different methods of procurement and financing, which can bring additional sensitivities to be considered. For example, some financing options are sensitive to inflation, such as loan repayments that are indexed to a specific percentage or the rate of inflation, whichever is greater. Institutions also need to assess what might happen if inflation falls, leaving them with repayments which increase in real and in cash terms.

Analysing the results

43. The principles to be applied in calculating the results of an investment appraisal are generally well understood. They are covered in other literature, and in the Green Book. The following notes provide advice on specific points that sometimes give difficulty.

Calculating the present value of costs and benefits

44. Even when all the costs and benefits, including cost savings, are expressed in real terms it will generally not be possible to compare options directly because the costs and benefits are spread over time. Almost all expenditure proposals produce benefits later than the costs. With proposals for achieving the same objective, the choice is often between extra investment expenditure now and extra operating costs in later years. To compare options, costs and benefits must be discounted so that a single figure – the net present value (NPV) – can be calculated for each option. Examples of these calculations are at Annex D.

45. To give more weight to earlier, rather than later, costs and benefits, a discount rate is applied. The discount rate determines how rapidly the value today (the 'present value') of a future pound falls away through time, just as a real rate of interest determines how fast the value of a pound invested now will increase. It reflects the 'social time preference rate' of money – the fact that normally people would rather have cash now than later, and would prefer to pay bills later rather than sooner – and must not be confused with inflation. A fuller explanation of the rationale behind discounting is in section 5.48 of the Green Book.

46. The recommended discount rate is 3.5 per cent. It is a real rate, taking no account of inflation. For further discussion on discount rates see the Green Book, Annex 6.

47. However, users must appreciate that this rate relates solely to the social time preference rate, and makes no allowance for other factors such as risk or optimism bias. It is therefore particularly important that appraisals make explicit provision for risks. In the early stages of an appraisal, before a detailed understanding of each option has been developed, it may be sufficient to make a composite estimate of the optimism inherent in the estimates of costs and benefits, using past performance as a guide. However, as the appraisal is refined,

risks will be separately identified, using the risk register as a guide, and individually costed and analysed. Further advice is in the Green Book, Annex 4.

48. The discount rate will be less than the institution's cost of borrowing. This is because the cost of borrowing will reflect the market's perception of the risks of lending to that institution. However, interest rates may not reflect the risks of a particular project, and so their use is not a substitute for analysis and costing of project-specific risks. Furthermore, interest rates are quoted in nominal terms, which reflect inflation, whereas discount calculations are normally made in real terms.

Comparing financial options

49. All other things being equal, the most beneficial option will be the one with the highest net present value or lowest net present cost. This is the appropriate basis for comparison. In the simplest cases, the costs and benefits of each option can be expressed as differences from the 'do nothing' values. However, this can lead to confusion in more complicated cases, particularly where the structure of the costs and benefits varies significantly from option to option, and from the structure of the 'do nothing' case. It can be difficult to keep track of all the variables, and there is a significant risk of double counting, with the same change being listed as a cost in one option and credited as a benefit to another. As a general rule, it is better to list the costs and benefits of each option separately, including the 'do nothing' option.

50. Use of the NPV or net present cost measure has the advantage of focusing attention on the actual costs and benefits derived from the project year by year. This is particularly helpful for institutions in appraising project options where affordability will be a key factor in decision making.

Handling inflation

51. Normally, net present values are calculated by expressing all costs and benefits in present value terms, and applying a real discount rate. This approach is valid so long as all the factors included in the calculation are affected equally by inflation. Costs and benefits should be expressed at prices applying when the appraisal is carried out. The figures will usually need to be reviewed and revised as part of the iterative process of investment appraisal, so it is important that the cost base used is clearly stated. This information is also required later for evaluation.

52. However, if there are grounds for expecting some prices to increase significantly faster or slower than inflation, the calculation should take this into account. For example, variation in fuel prices relative to the general price level will influence the real cost of heating a building. Another factor is pay, which in many sectors has risen in real terms. Construction costs may rise or fall during a project if the contract contains price variation clauses. Any such anticipated price changes that differ from the general price level will have to be justified.

53. Some leases provide for rent reviews, typically at five-yearly intervals and upwards only. Where the resulting rents represent a real rise or fall in costs, this must be allowed for in the appraisal.

54. The simplest and the preferred method of handling inflation is to use present values and a real discount rate. Where costs and benefits follow the general rate of inflation, any changes can then be ignored. Those costs and benefits which do not follow the general inflationary trend are adjusted to reflect the relative change.

Choice of options

55. In some appraisals, analysis of the options will result in a clear-cut recommendation. Often this will not be possible: for example when there are significant uncertainties attached to costs, benefits or both; or when significant elements exist which cannot easily be valued in monetary terms, or even quantified at all, such as environmental factors. Sensitivity analysis may also indicate that some options are more robust than others.

56. Where no clear-cut optimal solution is available, or the choice between two or more options is finely balanced, the appraiser should present the balance fairly, so that decision-takers can make an informed judgement.

Assessing affordability

57. So far, this guide has concentrated on assessing the competing merits of investment alternatives taken in isolation. However, there would be little point in adopting a solution that the institution could not afford. Therefore the institution must assess the impact of the preferred option on its overall financial position. This will involve looking ahead over the life of the proposal. The institution must be careful to distinguish between those costs and benefits which have a direct impact in cash terms, and those such as opportunity costs which impact on value for money but have no effect on affordability.

58. In particular, the institution will need to look at:

a. The income and expenditure generated by the project, and its impact on the institution's income and expenditure account.

b. The effect of depreciation on the income and expenditure account.

c. The effect on the institution's cash flow, broken down into sufficient detail to show the amount and timing of any shortfalls.

d. The project and its funding in the context of the overall capital expenditure programme, to keep track of the total level of proposed investment.

e. The funding of the project, the timing of receipts and their relationship with the cash flow.

f. The effect on the balance sheet.

g. The desirability of the project when compared with others, particularly if capital is limited and capital rationing decisions are required.

59. The institution will also need to consider how the project fits with its financial strategy, and how its policies on borrowing levels and contributions from the revenue budget might be affected.

60. The institution will have to draw on the appraisal's earlier work on risk and uncertainty, since it needs to know the possible financial impact of the best and worst case, as well as the planned outcome. It will also need to know whether there are any implications for its Financial Memorandum with HEFCE, and whether any additional approvals will be required. The strength of the institution's covenant – how its credit-worthiness is perceived by the financial sector – may influence its ability to make use of the full range of finance options, as well as their cost.

Presenting the results

61. The results of an appraisal should be set out in a report covering:

- the strategic context
- the objectives
- the options considered
- the results obtained, in both financial and non-financial terms
- the preferred option(s)
- how the preferred option(s) compare with the alternatives
- how the risks have been evaluated
- the sensitivities of the preferred option(s) to variations in key assumptions
- the impact on the institution's financial position
- how and when the project will be monitored and evaluated.

A more detailed checklist is at Annex A.

62. The appraisal's important features must be set out clearly, in a logical order, and all relevant assumptions should be made clear. The appraisal should indicate how the costs are to be borne. It should also include discussion of the major unquantifiable costs and benefits, and contain sensitivity analyses of the effects of changing key assumptions. Tables setting out in detail the costs, benefits and risks of each option should be available. In addition, it is important to record such details as the price basis and the base date for discounting.

63. Even after they have taken a decision, institutions will need to keep their appraisal under review. The initial appraisal will of necessity be based on coarse data which can be refined as the project progresses. Institutions will need to confirm their initial estimates as they reach key decision points, and check that their assumptions are still valid. This is an

iterative process. In the early stages, not much will be lost if re-appraisal leads to changes in key decisions; however, scope for manoeuvre will become more limited as a project progresses.

64. The report should set out clearly the effect of the preferred option on the overall financial position, by presenting forecasts of its effect on the income, expenditure and cash flow. The impact of changes in key assumptions should be modelled, showing the effect of best and worst case scenarios. The effect on key financial indicators and budgets should be made explicit.

Annex D

Example case study

This is a case study of a hypothetical project. In the interests of brevity, much of the detailed justification that would be expected of a real-life submission has been omitted.

Outline business case

Identifying the need

1. The University of Atlantis is on the outskirts of the city. It is largely based on one campus but has accommodation on three other smaller sites within a five-mile radius of the main one. Sargasso House occupies one of these sites. It is a former office block which is rapidly reaching the end of its useful life and is becoming increasingly expensive to maintain. In addition, the building is badly configured, makes inefficient use of the space and has limited disabled access. The University of Atlantis owns the freehold of the building, which currently houses the Department of Pelagic Thaumaturgy. The main site is 15 minutes' walk away.

2. Pelagic Thaumaturgy is an expanding area of study, and courses are over-subscribed. The University of Atlantis has a high reputation in this field. However, because of the limitations of the building it is unable to respond to the increasing demand for places. As a result, it cannot take advantage of the potential income from overseas students, nor can it expand its range of services. The project has two aims:

   a. To provide cost-effective and suitable accommodation for existing students.

   b. To provide additional space for expansion of the department's activities.

3. The existing building provides 4,000m^2 of usable space. Providing an additional 1,000m^2 would enable the university to accept an additional 100 overseas students. There would be higher administration and staff costs, but the additional students would bring an extra net annual income of £180,000.

The strategic context

4. The overall strategy of the university focuses on a number of key aims which are relevant to this project: -

   a. The university has a commitment to become a regional centre of excellence. The provision of high quality, flexible space has been identified as key to its continued success.

   b. The continued development of Pelagic Thaumaturgy is one of the key elements of the university's corporate strategy. The department has become increasingly successful and popular, and the university is now receiving national recognition for its work in this area.

c. The university is committed to improving access for disadvantaged minorities, including people with disabilities.

Estates strategy

5. The key relevant objectives of the university's estates strategy are:

a. To provide a high quality environment for students and staff that makes the best use of its physical assets.

b. As a long-term aim, to locate all its teaching accommodation on or close to its main campus. One of the highest priorities within the strategy is expanding the space for Pelagic Thaumaturgy.

c. To recognise that any new accommodation should be suitable for current and planned requirements, but should retain sufficient flexibility to adapt to future changes as the shape of HE continues to evolve.

Key objectives

6. Accommodation needs to be:

- high-tech, high quality and flexible
- low maintenance, with reduced running costs
- fully accessible to people with disabilities
- close to or on the main campus.

Identification of options

7. A number of options to solve the problem have been identified:

a. Option 1: Status quo – carry out essential maintenance and repair works only. This is not seen as an acceptable option due to the extent of work required and the increasingly unsatisfactory nature of the accommodation. However, this option has been included to provide a base case against which to assess other alternatives.

b. Option 2: Major refurbishment of Sargasso House. Stripping the building back to its shell and carrying out substantial reconfiguration and refurbishment could deliver the level of quality and flexibility sought, but would not overcome all the restrictions of the building nor address the location issue.

c. Option 3: Demolish Sargasso House and rebuild on same site. Demolishing Sargasso House and constructing new purpose-built accommodation would deliver improvements in quality and flexibility. However, proximity to the main site would still

be an issue, and planning restrictions would mean that no extra floor area could be provided.

d. Option 4: Dispose of Sargasso House and purchase alternative accommodation. A search for alternative accommodation within a five mile radius of the main site has only identified one possible building (three miles from the main campus). However, it is virtually twice the size of the existing building so would probably only be viable if the university had a use for the additional space.

e. Option 5: Dispose of Sargasso House and lease alternative accommodation. The city contains a number of vacant office blocks, and there is at least one developer who is willing to refurbish one to the university's requirements.

f. Option 6: Dispose of Sargasso House and build new accommodation on another site. The city contains a number of development sites which the university could buy, on which to build a new building of the size it needs. However, none of the sites are any closer to the main campus than Sargasso House.

g. Option 7: Dispose of Sargasso House and build new accommodation on the main campus. There is potential to build on the main campus between two existing buildings, but space is restricted. Some reconfiguration of existing buildings used by other departments would be required, such as relocating entrances, and they would be denied all opportunities for further expansion.

h. Option 8: Dispose of all three satellite sites and purchase alternative accommodation. A possible building was identified under option 4 that is large enough to accommodate the activities from all three satellite sites. However, the other two sites currently operate quite effectively as satellite sites and do not suffer from the problems faced at Sargasso House. In addition the disposal value of these two sites is limited due to restrictions in use, so the proceeds of all three sites would leave a substantial funding gap for the university. This option was not pursued further, on the basis that it would run directly contrary to the university's long-term aim of consolidating its operations on or near the main site.

i. Option 9: Dispose of all three satellite sites and build replacement accommodation next to the main site. The current site could not accommodate additional accommodation of this size. Space next to the main site exists on a site already owned by the university, but because of an existing tenancy agreement this will not be available for another five years. A temporary arrangement would be required in the interim. The university recognised that this might be an option in the longer term but would not solve the immediate problem, so it decided not to pursue it further.

Initial option appraisals

8. Having discarded options 8 and 9, the seven remaining options were subject to an initial appraisal.

9. The financial costs and benefits of each option are set out in Appendix 1. There are a number of quantifiable benefits which accrue to one or more of the options:

a. Overseas students. There is considerable potential for recruiting additional students from overseas, which could generate a net income if they could be taught alongside the existing student body. Residential space would not be a problem, since there is a thriving local market in private rented accommodation. However, no teaching space can be provided for them on the existing site.

b. Postgraduate students. The department's ability to accommodate postgraduate students is severely constrained by the existing building. A new building on the same site would deliver more income from postgraduate teaching, and a building on any other site would allow still greater scope.

c. Contract income. There is a demand for contract research work which the department is unable to fulfil in its existing premises. A rebuild on the same site would allow part of this demand to be met, and it could all be met on another site. There would be additional running costs associated with this work, but a small net income.

d. Kiosk. The existing building contains a small book-selling and newsagents kiosk which provides a rental income. A new or refurbished building would allow a slightly higher rent to be charged; a development on the main site, which would bring in more business, would offer double the rent.

Discount rate

10. The university used a discount rate of 3.5 per cent in its calculations. However, it recognised that this rate made no provision for risk or optimism bias. At this stage it had not made a detailed assessment of the risks for each option. Past experience of earlier appraisals indicated that it had tended to underestimate the through life costs of new-build options by 20 per cent, the cost of refurbishment options by 10 per cent, and the cost of options to lease or buy a completed building by 5 per cent. It therefore applied appropriate adjustments for optimism bias to the results of the calculations.

Non-financial aspects

11. The university recognised that there are a number of other factors which might influence the choice of options. To structure the decision process, it carried out an appraisal of the non-financial aspects of each option, using a scoring system.

12. The university identified seven criteria against which to judge the options. These were:

- academic image, to reflect the standing of the Department of Pelagic Thaumaturgy
- flexibility, to provide scope to react to changing requirements in the future
- quality, to meet the need for a work environment of a high standard

- proximity to the main campus, in support of the long-term aim of bringing the university's estate together on one site
- continuity (lack of disruption) in the work of the department and other faculties
- timescale, to deliver an acceptable solution
- access for people with disabilities.

13. Each criterion was given a weighting, to reflect its perceived relative importance. Then each option was marked on a scale of ten for each of the criteria. The results of this exercise are shown in Table I, showing the raw (R) and weighted (W) scores.

Table I. Appraisal of non-financial benefits

Criteria	Weight	Options													
		1		2		3		4		5		6		7	
		R	W	R	W	R	W	R	W	R	W	R	W	R	W
Academic image	10	2	20	5	50	8	80	6	60	5	50	8	80	8	80
Flexibility	8	5	40	5	40	5	40	6	48	8	64	6	48	4	32
Quality	8	2	16	4	32	6	48	5	40	5	40	6	48	7	56
Proximity	8	4	32	4	32	4	32	2	16	6	48	6	48	10	80
Continuity	6	4	24	2	12	2	12	8	48	8	48	6	36	6	36
Timescale	6	8	48	6	36	4	24	6	36	6	36	4	24	4	24
Access	4	2	8	4	16	8	32	6	24	6	24	8	32	8	32
Weighted total			**188**		**218**		**268**		**272**		**310**		**316**		**340**

R = raw score
W = weighted score

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Selection of the preferred option

14. The results of this initial appraisal are summarised in Table II.

Table II. Results of initial options appraisal

Option	NPV (£000)	Optimism bias (%)	Adjusted NPV	NPV relative to Option 1	Weighted score
1: Status quo	-8,695	0	-8,695	0	188
2: Refurbishment	-6,685	10	-7,354	1,341	218
3: Rebuild on existing site	-7,395	20	-8,874	-179	268
4: Purchase alternative building	-7,862	5	-8,255	440	272
5: Lease alternative building	-7,765	5	-8,153	542	310
6: New building on new site	-4,620	20	-5,544	3,151	316
7: New building on main campus	-5,103	20	-6,124	2,571	340

15. Table II indicates that options 6 or 7 offer the best overall value for money, so they were selected as potential preferred options for further investigation. However option 2 was judged to be worth further investigation as a lower cost alternative, and option 5 was retained in case any of the other alternatives proved not to be affordable in cash terms.

16. As a result of this initial appraisal, the university decided to pursue four options in more detail, to compare with the status quo ('do minimum') option. These were:

- option 2 – major refurbishment of the existing building
- option 5 – lease alternative building
- option 6 – dispose of Sargasso House and build new accommodation on another site
- option 7 – dispose of Sargasso House and build new accommodation on the main campus.

Initial assessment of affordability

17. The preferred options selected for further investigation show a positive NPV when compared with the status quo. However, to check affordability, the university needed to look at the associated cash costs. Certain elements of the option appraisal are not relevant in this assessment, notably the initial opportunity costs, and possibly the residual values. In any case, residual values need to be treated with caution since they are based on a very long-term prediction. In this case, the preferred options involve a significant initial capital investment. The

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university has limited internal funds, and would almost certainly need to borrow to finance the capital expenditure. Therefore the preferred option cannot be properly assessed for affordability without considering the financing arrangements.

18. As a guide to affordability, the university looked at option 5, which is based on lease payments. The initial appraisal indicates that the annual cost of this option would be about £180,000 more than the status quo in a typical year. There would also be fitting-out costs in the first year, but the university's advisers indicated that it might be possible to negotiate an initial rent-free period to compensate. This option was deemed to be affordable within the university's existing operating budget.

19. If the university decides to pursue one of the other options, to refurbish the existing building or to build new, financing costs will have to be considered. This is an intrinsic part of developing the full business case, when alternative procurement routes will be investigated for all options still under consideration.

Recommendation

20. At this stage the Finance Committee was able to recommend the project to the Board of Governors, on the basis that there were options which appeared to be affordable and better value for money than the status quo. They based this recommendation on the fact that there was more than one option which appeared to offer benefits in financial terms, and on an assessment of the potential non-financial benefits. The Board agreed to support the project on the basis of the initial appraisal, and gave its approval to proceed to a full business case, However, it deferred a final decision until the full business case had been assessed.

Full business case

21. The project was developed in greater detail to explore the various procurement and financing routes available to the university, depending on which option it chose. At this stage, the lease option already had an identified funding method associated with it. However, the refurbishment and new-build options offered scope for alternative financing and procurement techniques, which might be combined in innovative forms of procurement such as PFI.

Potential for PFI

22. The potential for a PFI solution for the project depends on whether it can be expressed as a service requirement, in terms of an output specification. Obviously the core activities of providing teaching and research would remain the responsibility of the university. The main services in the project are the provision of space, and the ongoing maintenance and servicing of the building, including cleaning, security and portering. There is also scope to run a small element of peripheral services on a purely commercial basis, in the form of the kiosk for a bookshop and newsagent.

23. The option for refurbishing the existing building, and one of the proposals for new building, was as a stand-alone facility remote from the main campus. The university therefore accepted that an independent supplier might be able to offer a competitive alternative, and that it should explore a PFI option in these two cases. (Further advice on PFI, and on using a soft

market test to explore PFI options is available in the HEFCE's publication 'A practical guide to PFI for higher education institutions', HEFCE 98/69.)

24. For the new-build option on the main site, where the facilities would form an integral part of the existing campus, the potential for an external supplier to offer a competitive deal is much reduced. This is because the supplier would have to absorb the full cost of the service provision, whereas the university already operates on the rest of the site and can provide the same services at marginal cost. The university has a history of difficult industrial relations on its main site, and was reluctant to consider outsourcing some or all of its existing service provision there. For this reason, it decided that the new-build option on the main site was not an appropriate candidate for PFI. *(In real life, institutions will have to make their own assessment of such factors.)*

Other procurement options

25. To assess the conventional procurement options available to the university, it was first necessary to identify the criteria and constraints for the project. These included the timescale in which the space needed to be provided, the need to keep a tight control on costs, and the complexities of the location of the new building. However, the university was also aware that some of its members expected to see a high quality solution reflecting the standing and prestige of the department. The university already has a strong in-house project management team, which has recently overseen the completion of a student residence development, to time and budget. (Further advice on conventional procurement routes for buildings is available in 'Procurement guidelines for higher education: building and engineering projects'. This is produced by the Joint Procurement Policy and Strategy Group.)

Financing options

26. Because the university was considering conventional procurement options, and had insufficient reserves to meet the capital cost of a major building project upfront, it needed to investigate the availability of financing for the project. The university recognised the importance of securing the funding package before fully committing to the project. It sounded out a selection of leading financial institutions to assess interest in financing the project. This demonstrated that there would be sufficient interest in the finance sector to achieve a competitive deal, and confirmed that the university could borrow at a nominal rate of 8.0 per cent over 25 years. Its finance advisers assessed the long-term inflation rate to be 2.7 per cent, indicating that the university's real interest rate is 5 per cent. This rate was used to calculate the level of loan repayments in the following appraisals. (Note that the relationship between these rates is correctly expressed as 1.08/1.027 = 1.05. The simpler calculation 8.0 – 2.7 = 5.3 is only an approximation)

27. The university then undertook a more detailed appraisal of the following options:

a. Option 1: Status quo – carry out essential maintenance and repair works only.

b. Option 2a: Major refurbishment of existing building. To be undertaken by conventional procurement methods.

c. Option 2b: Major refurbishment of existing building. To be carried out under a PFI contract.

d. Option 5: Dispose of Sargasso House and lease alternative accommodation.

e. Option 6a: Dispose of Sargasso House and occupy alternative accommodation. To be built on a new site.

f. Option 6b: Dispose of Sargasso House and occupy alternative accommodation. To be carried out under a PFI contract.

g. Option 7: Dispose of Sargasso House and build new accommodation on the main campus. The university normally uses design and build contracts for conventional procurement, to provide protection against cost increases during the construction period.

Shadow PFI bid

28. The true costs of a PFI alternative will not be known until a deal is struck, though the university would be able to get some idea when it starts to investigate the market. To estimate the costs of the PFI alternatives before reaching this stage, the university had to construct a 'shadow PFI bid'.

29. The shadow PFI bid is based on the assumption that a PFI supplier would face much the same capital and operating costs as the university. In reality one might expect a PFI supplier to achieve lower life-cycle costs from better integration of capital and running costs, or from taking advantage of other benefits such as economies of scale. In generating a shadow bid, the university made a modest assumption that these might total 5 per cent of the maintenance and utilities costs. This generates a slightly lower NPV for the PFI option when the same discount rate is applied.

30. However, the costing of the shadow bid also has to recognise that private sector bidders will require a higher rate of return to compensate them for the risks they bear in this form of procurement. The NPV of the shadow bid therefore has to be converted into annual payments which reflect this higher return. For this estimate, the university assumed that a private sector bidder would have to pay about 5 per cent in real terms for debt financing, since funders would see the same sort of risk in funding the project infrastructure whether it was built by the private sector or by the university. However the private sector would also look for a return of 30 per cent on the equity, which would make up 10 per cent of the total finance package. The shadow bid therefore assumes the bidder would require an overall return of 7.5 per cent (a weighted average of the two rates). By applying this rate of return to the NPV, the university can calculate the annual payments that a notional PFI supplier would require. Details are shown in Appendix 2.

Risk assessment

31. In developing this detailed appraisal, the university recognised that it needed to develop a more sophisticated approach to risk, rather than the simple correction for optimism bias

used in its initial outline assessment. The first step was to compile a risk register showing the key risks associated with the project, and indicating those which would affect each option. The list is shown in the table at Appendix 3. (This is a typical example, rather than a checklist for all projects. Developing such a checklist is an important early step in the project process, since it is one of the key pieces of information in assessing the relative merits of each option.)

32. The university then ascribed a probability of occurrence to each of the risk factors, using four categories: high (75 per cent probability), medium (45 per cent), low (25 per cent), or negligible (0 per cent).

33. For each risk factor, the cost impact was estimated. Combining the cost impact and the probability gives the risk value. The appropriate risk values were added to the costs of each option. A key factor was the allocation of risks. For instance, if the university undertook a straightforward refurbishment of the existing building, or built a replacement on a new site, and was responsible for all aspects of operation and maintenance, then it would need to cost the associated risks. If it adopted a PFI approach, then some risks would be transferred to a private sector operator and the costs would be covered by the unitary payments to the operator.

34. Appendix 4 gives the full appraisal of the options. In summary, the NPVs of the options are shown in Table III.

Table III. Summary of net present value (NPV) for each option

Option	NPV (£000)	NPV relative to Option 1	Weighted score
1: Status quo	-9,639	-	188
2a: Refurbishment	-8,411	1,228	218
2b: Refurbishment using PFI	-10,199	-560	268
5: Lease (alternative site)	-8,889	750	272
6a: New-build (new site)	-8,691	948	310
6b: New-build (new site) – PFI option	-9,609	30	316
7: New building on main campus	-9,059	580	340

It is clear that conventionally funded refurbishment (option 2a) is the most attractive option in financial terms, closely followed by building on a new site (option 6a). However, the balance of the weighted scores might well persuade the university to opt for the new building. Neither PFI variant appears particularly attractive – the advantages of a PFI solution depend on the scope for risk transfer, and in this particular project there is no very big service element.

Sensitivity analysis

35. The university recognised that there were other uncertainties which could affect the project. Two in particular gave cause for concern:

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a. Given the politically volatile climate in the pelagic region, there is a serious danger that some of the income from overseas students might not materialise.

b. The rate of inflation might change. A conventionally procured option might be linked to fixed-rate finance. This would be vulnerable to a fall in inflation, which would effectively increase the real interest rate. A PFI deal would not be affected in the same way. PFI deals are typically index-linked. The unitary charge (the regular payment in a PFI deal) would rise to keep pace with inflation, and so the real cost would be unaffected. PFI deals can also be subject to regular benchmarking, so that they follow falling inflation as well, albeit not immediately.

36. Either variable could give rise to an affordability problem, as well as affecting the relative merits of the options under consideration. Both were subjected to a sensitivity analysis (see Appendix 5). The analysis was applied to options 2a and 6a as the two most attractive and viable options in financial terms. The results are summarised in Table IV.

Table IV. Summary of sensitivity analysis

Variable	Cost of options – NPV relative to Option 1 (£000)	
	Option 2a	Option 6a
Base case	1,228	1,116
Overseas student income halved	1,228	-284
Inflation falls 1%	828	-29
Inflation falls 1% and income halved	828	-1,261

37. The sensitivity analysis indicates that option 2a is more resilient from a financial point of view. Although some circumstances might reduce the relative NPV, it would still remain positive. The university would be wise to check that it is still affordable under these conditions.

Assessment of affordability

38. Before taking the final decision to proceed with this project, the university carried out a further affordability assessment based on the latest and more detailed costs, proposed procurement method and financing arrangements. In this particular example, a conventional procurement option was chosen, and it would be appropriate at this stage to explore competing financing options, to confirm that the university's initial assessment of financing costs still reflected what it could secure in the market.

39. If a PFI option had been chosen, the university would find it useful to carry out a soft market test, to confirm that the private sector takes a similar view about the viability of the project.

40. In a full assessment of affordability, the starting point is the institution's existing position, as if the project were not to be undertaken. The institution should base the assessment of affordability on its projections of income and expenditure, cash flow and balance sheet position, looking as far ahead as it can reasonably forecast. It will look at how the project affects all these areas, considering the cumulative impact as well as the incremental changes year on year. In the longer term it may be acceptable to consider the annual effects, but it should look more closely at the impact in the early years. For instance, if loan finance is used to undertake a project by conventional procurement, the institution may need to analyse the effect on its financial position month by month, having regard to the drawdown facilities of the loan.

41. In this case 10-year projections of income and expenditure, cash flow, and balance sheet position were produced for the selected solution, to confirm that the project was affordable in terms of both capital and revenue. It was confirmed that the annualised servicing costs of the new facility would take the total to 2.3 per cent of total income, still comfortably within the threshold set by the Financial Memorandum with HEFCE.

Confirmation of decision to proceed

42. With all the information available, the Board re-examined the case for proceeding with the project. It reviewed the non-financial benefits that would result, and understood the risks

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and sensitivities inherent in the case. As in all cases where the underlying NPV is negative, it is ultimately a matter of judgement whether the university is paying a fair and reasonable price for the benefits that the project will deliver, particularly when few of these benefits can be expressed in financial terms. In making this judgement, the Board looked particularly at the changes from the status quo, and the relative costs and benefits of the options under review. Presenting the costs and benefits of each option in a structured way helps to establish that the final decision is based on a clear understanding of what the project involves, what benefits it will deliver, and why a particular option was chosen. The Board also needed to be satisfied with a clear explanation of how the project is to be financed, and how it can be afforded.

43. The Board examined the proposals for managing the project, to satisfy itself that the project was properly resourced. It also looked at the project plan, to get an assurance that it provided for regular reports to the Board on progress, and further consultation at key decision points.

44. With a full understanding of what the project entailed, the Board gave its approval to proceed. This approval was conditional on being advised of any significant changes in the assumptions underlying the appraisal.

Annex E

Appraising investment decisions – non-property example

This case study is presented as an example of an institution faced with a problem which is not wholly related to buildings or equipment. It shows how the problem can still be resolved into a choice between several options, which can be the subject of a financial analysis. However, there are also a number of non-financial and non-quantifiable aspects to be considered.

1. In the unusual aquatic environment of Atlantis, biological studies represent a particular challenge. Nearly all teaching is dependent on a fundamental understanding of the biology of the jabberwock.

2. Dissection of the common jabberwock has long been an intrinsic part of every foundation course in natural sciences. Every student is provided with an individual jabberwock to dissect, under the supervision of a staff of expert demonstrators. Such is the importance of the demonstrator's role that it is seen as a fundamental element of a successful academic career.

3. However, this policy is now being challenged on two grounds:

   a. Many students, and some members of the teaching staff, question the morality of a policy that depends on the death of a living creature.

   b. Despite its name, the common jabberwock is becoming increasingly rare. Furthermore, the university has hitherto acquired nearly all the specimens it requires from those that die trapped in the nets of fishermen. The widespread implementation of 'jabberwock friendly' fishing methods means that fewer specimens are available.

4. From a practical point of view, dissection specimens which were once available at a nominal cost as a by-product of the fishing industry are becoming increasingly expensive, and it is difficult to ensure a regular supply.

5. It has been suggested that the crested jabberwock would be an acceptable substitute. An aggressive scavenger, originally introduced to provide an environmentally friendly method of waste disposal, the crested jabberwock is largely responsible for displacing the common jabberwock from its natural feeding grounds. It is generally unloved, and regarded as a pest. However, it has significant disadvantages as a laboratory specimen:

   a. It has never been bred successfully in captivity, and its feeding habits mean it is rarely caught in fishermen's nets, so a special trapping programme would be required.

   b. Largely because of its revolting feeding habits, it acquires an obnoxious smell which makes it particularly unpleasant to handle, even when dead.

6. The other alternative specimen might be the spotted jabberwock. This docile creature is the result of many years of captive breeding. Prized for its decorative appearance, it is often kept as a child's pet. It would be entirely feasible to set up a breeding programme to provide laboratory specimens. However, this would be likely to exacerbate the moral objections to killing creatures to provide a teaching aid, particularly through an unfortunate association with the popular cartoon character 'Spot the Jabberwock'.

7. A number of technical alternatives have been proposed. Perhaps the simplest is to depart from the policy of 'hands on' dissection by students, and substitute a programme of teaching by demonstration. However, the delicate nature of jabberwock biology would make it difficult to provide an adequate demonstration without considerable investment in additional visual aids. Many academic staff argue that teaching standards would suffer, even if the most sophisticated closed circuit television equipment were used.

8. The department of computing science has suggested two alternative routes:

a. To supply each student with a demonstration on compact disc, which could be viewed as many times as required using the computer facilities available to every student. This would make most of the existing dissecting facilities redundant. More significantly, there would be considerable resistance from the existing staff of demonstrators, who see their livelihood disappearing.

b. To develop a 'virtual reality dissection experience'. The department of computing science is particularly keen to develop its expertise in this field. However, there are considerable doubts whether a suitably realistic solution could be made available in a sensible timescale. Cynical detractors suggest that this proposal is principally focused on satisfying the grandiose aspirations of the head of the department rather than providing a service to the natural sciences faculty. It is likely to be extremely capital intensive and have considerable set up costs.

Options for analysis

9. The university identified the following options for analysis:

a. <u>The status quo</u>. If no action is taken, it is likely that student numbers will fall, due in part to moral objections but also because there is a possibility that the learning experience will be diminished if insufficient dissection specimens are available.

b. <u>Use the crested jabberwock</u>. There are likely to be fewer moral objections to the use of a creature widely regarded as a pest. However, the university will have to set up a trapping programme. More importantly, the noxious nature of the creature will require significant improvements to the ventilation systems in the dissection laboratories, if staff and students are not to be overcome.

c. <u>Use the spotted jabberwock</u>. Moral objections may lead to a fall in student numbers. The university will have to set up a breeding programme to provide the

specimens. Because of the widespread public criticism that may ensue, it will have to finance a public relations programme to explain its actions, and even then it will have to provide enhanced security for both the new breeding premises and the existing laboratories.

d. Substitute demonstrations for hands-on dissection. This will require the provision of specialist audio-visual equipment, and significant reconfiguration of the existing dissection laboratories to suit the new teaching techniques. Some demonstrators may become redundant, though there is a possibility they can be retrained, at a cost, as equipment maintainers. There will still be some ethical concerns over the death of live specimens.

e. Produce a compact disc as a teaching aid. It is anticipated that this will require significant investment in specialist support, and also considerable time from academic staff. The extent of co-operation from the existing demonstrators is doubtful, and in any case this option will have to include provision for redundancy payments. Retraining demonstrators for a very different teaching support role may be possible, but is likely to be expensive.

f. Develop the virtual reality experience. Despite the enthusiasm of the department of computing studies, there is little information on the possible costs of this option, and the timescale to achieve an acceptable substitute is difficult to determine.

Risks and uncertainties

10. The university has identified that it will have to address the following areas of risk and uncertainty:

- student numbers
- timescale
- reaction of existing staff
- supply
- unproven technology.

Non-quantifiable aspects

11. The university will also have to consider a number of non-quantifiable aspects:

- moral acceptability
- environmental impact

- public perception of university
- quality of teaching/learning experience
- staff career development.

In this case study we have indicated the issues to be considered, but we have stopped short of developing the full details of the appraisal process and generating financial data. These aspects are illustrated in Annex D.

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